

ENDURANCE™ Conductivity Sensors

For additional information, please visit our website at www.rosemountanalytical.com

CAUTION Sensor/Process Application Compatibility

The wetted sensor materials may not be compatible with process composition and operating conditions. Application compatibility is entirely the responsibility of the user.

CAUTION

The 402 and 402VP sensors are retractable. **BEFORE RETRACTING THE SENSOR**, be absolutely certain the process pressure is less than 64 psig (542 kPa abs) and the process temperature is at a safe level!

Sensor Specifications

Specifications	402	402VP
Electrode	-11, -12, -13 titanium	-11, -12, -13 titanium
Insulator	-11, -12, -13 PEEK (glass filled)	-11, -12, -13 PEEK (glass filled)
Other Wetted Materials	316 SST, EPDM, graphite, Neoprene	316 SST, EPDM, graphite, Neoprene
Temperature Range	32–212 °F (0–100 °C)	32–212 °F (0–100 °C)
Maximum Pressure	200 psig (1481 kPa abs)	200 psig (1481 kPa abs)
Maximum Retraction Pressure	64 psig (542 kPa abs)	64 psig (542 kPa abs)

Sensor Orientation

Figure 1. Sensor Orientation

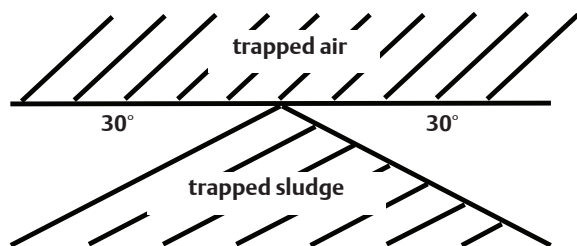
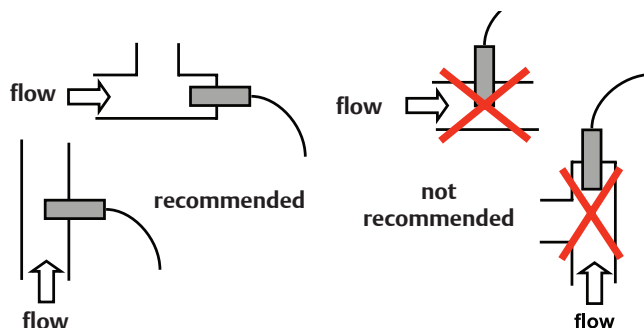
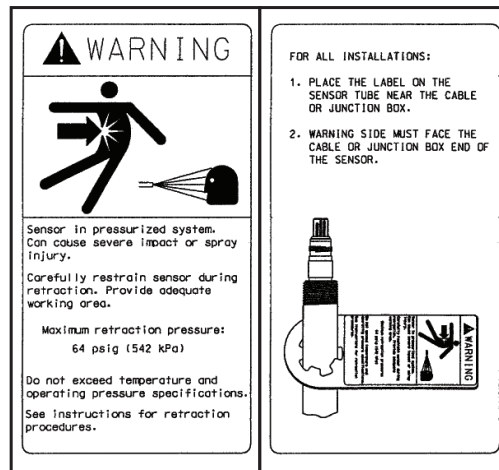


Figure 2. Recommended Installation



Keep ¼ in. (6 mm) clearance between electrodes and piping. The electrolytes must be completely submerged in the process liquid, i.e., to the upper edge of the guard (item 10 in Figure 3).

Installation and Retraction of Sensor



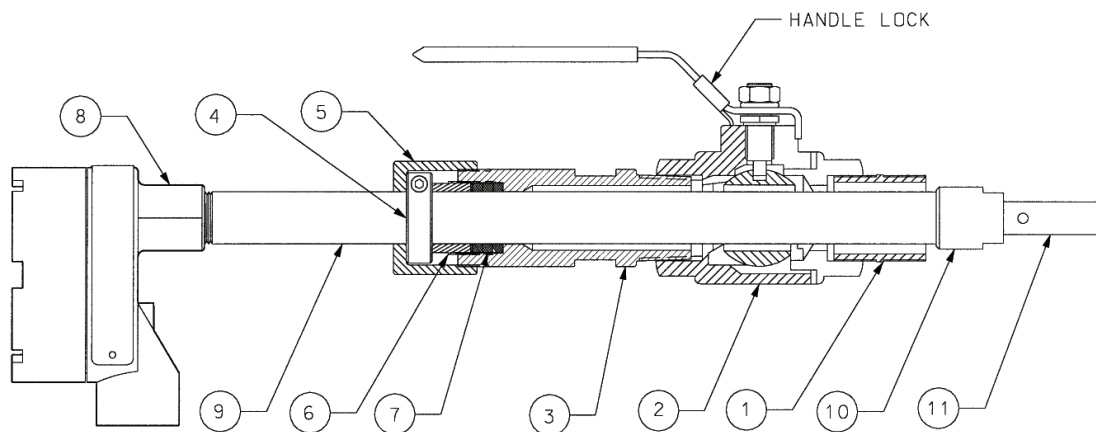
Installation

Retraction assembly kit (PN 23765-00) consists of items 1 through 7 shown in Figure 3 as well as a hex key and pipe tape. The sensor assembly includes items 8 through 11.

IMPORTANT!

Do not remove or alter the guard (10) on the sensor tube (9).

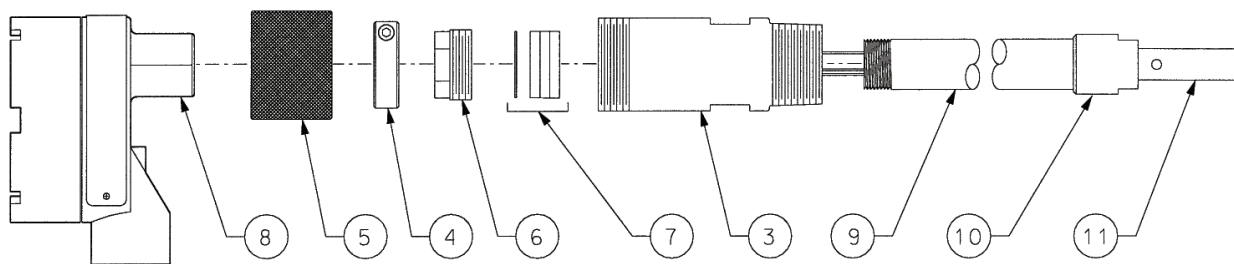
Figure 3. 402 Sensor with Retraction Assembly Kit



1. NIPPLE (PN 4342M)
2. BALL VALVE (PN 9340078)
3. PACKING ADAPTER (PN 33578-00/01)
4. CLAMP (PN 33579-00)
5. RETAINER (PN 33577-00)
6. PACKING BUSHING (PN 4357M)
7. PACKING RINGS (PN 9160410)
8. JUNCTION BOX
9. SENSOR TUBE
10. GUARD
11. SENSING ELEMENT

1. Make sure the system is shut down and there is no residual pressure.
2. Attach the ball valve (2) to the process piping using the 1-¼-inch FNPT port on the valve or the 1-¼ inch NPT nipple (1). Use pipe tape on male threads.
3. Slide the handle lock up on the ball valve handle and close the ball valve (2). If the process will be restarted before the sensor is installed, make sure the system pressure is at or below 542 kPa abs (64 psig) before proceeding. If the system will not be restarted until after the sensor installation, leave the valve in the open position.
4. If the sensor includes a junction box (8), it must be removed from the sensor to install the retraction assembly kit. Disconnect the sensor wires inside the junction box prior to disassembly.
5. Follow Figure 4 to assemble the sensor and retraction assembly. Keep items 3-7 in the proper sequence. Items 3, 6, and 7 are factory assembled.
6. Position the sensor tube (9) so that the electrodes (11) are completely withdrawn inside the packing adapter (3). If it is difficult to slide the sensor through the packing rings, loosen the packing bushing (6).
7. Position the clamp (4) on the sensor tube (9) so that the electrodes (11) will be completely immersed in the process liquid when the sensor is fully inserted through the ball valve. See Figure 3. Use the hex key to secure the clamp to the sensor tube.
8. Slide the retainer (5) onto the sensor tube (9).
9. Screw the junction box (8) — hand tight — onto the sensor tube (9). DO NOT OVERTIGHTEN. Use 2-3 wraps of pipe tape on the tube threads if a NEMA 4 seal is required at the junction box.
10. Apply pipe tape to the packing adapter (3) threads and screw the packing adapter onto the ball valve.
11. Check to ensure that the packing bushing (6) has been tightened. You should be able to push the sensor tube (9) against the resistance provided by the packing rings (7).
12. Open the ball valve (2).
13. There may be some leakage around the packing bushing (6). Tighten the packing bushing to stop the leak. Use the junction box (8) or sensor rear to push the sensor through the valve until the clamp (4) rests against the packing bushing.
14. To secure the sensor tube (9) in place, tighten — hand tighten only — the retainer (5) against the back of the packing adapter (3). If the sensor tube retracts when the system pressure is increased, reduce the pressure to 542 kPa abs (64 psig) or less, remove the retainer (5), and tighten the screw in the clamp (4).

Figure 4. 402 Sensor Installation



3. PACKING ADAPTER (PN 33578-00/01)
4. CLAMP (PN 33579-00)
5. RETAINER (PN 33577-00)
6. PACKING BUSHING (PN 4357M)
7. PACKING RINGS (PN 9160410)
8. JUNCTION BOX
9. SENSOR TUBE
10. GUARD
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Retraction

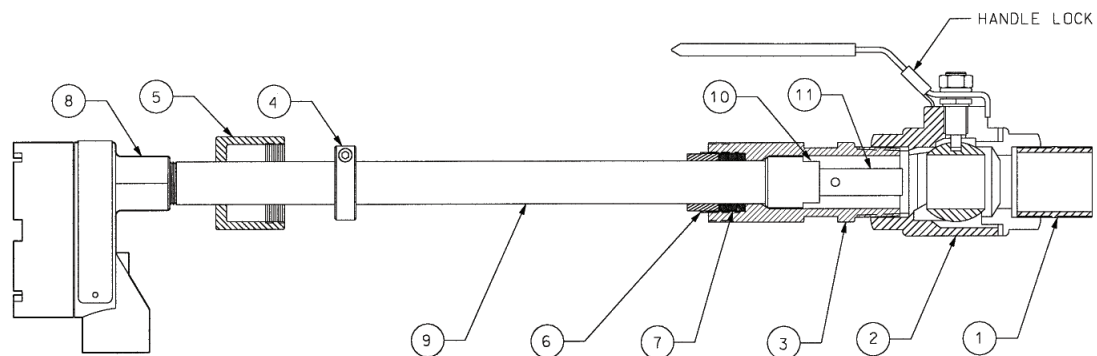
1. Make sure the system pressure is at or below 542 kPa abs (64 psig) at the valve before proceeding. Provide adequate working area for retraction.
2. Unscrew the retainer (5) from the packing adapter (3). If it is difficult to unscrew the retainer, system pressure may be forcing the clamp (4) into the retainer. The packing bushing (6) may not be tight enough to hold the sensor tube (9) in place. To prevent a sudden retraction of the sensor tube as the retainer is removed, hold onto the junction box (8) or sensor rear to restrain the sensor.
3. If the sensor tube (9) does not slide back as the retainer is unscrewed, pull back on the junction box (8) or sensor tube to retract the sensor.
4. If the sensor tube (9) cannot be retracted, loosen the clamp (4) using the hex key. Pull the clamp back and slowly loosen the packing bushing (6) in 1/8-turn increments. System pressure may cause the tube to retract. If not, pull back on the junction box (8) or sensor tube (9) to withdraw the sensor.
5. Withdraw the sensor tube until the guard (10) contacts the stop inside the packing adapter (3). The electrodes (11) are now inside the packing adapter. See Figure 5. Slide the handle lock up on the valve handle and close the ball valve (2).

IMPORTANT!

Failure to withdraw the sensor completely may result in damage to the electrodes when the valve is closed.

6. Unscrew the packing adapter (3) from the ball valve (2) to remove the sensor and retraction assembly.

Figure 5. 402 Sensor in Retracted Position



1. NIPPLE (PN 4342M)
2. BALL VALVE (PN 9340078)
3. PACKING ADAPTER (PN 33578-00/01)
4. CLAMP (PN 33579-00)
5. RETAINER (PN 33577-00)
6. PACKING BUSHING (PN 4357M)
7. PACKING RINGS (PN 9160410)
8. JUNCTION BOX
9. SENSOR TUBE
10. GUARD
11. SENSING ELEMENT

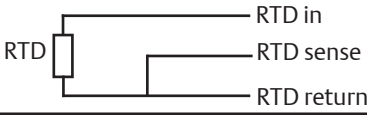
Wiring

Note

For additional wiring information on this product, including sensor combinations not shown here, please refer to either our online wiring programs or the Manual DVD enclosed with each product.

1056, 1057, 56, 5081, 6081, 54e, and XMT : <http://www3.emersonprocess.com/raihome/sp/liquid/wiring/XMT/>
 1066 and sensors with SMART preamps: http://www2.emersonprocess.com/en-US/brands/rosemountanalytical/Liquid/Sensors/Pages/Wiring_Diagram.aspx
 1055: <http://www3.emersonprocess.com/raihome/sp/liquid/wiring/1055/>

Wire Color and Connections in Sensor

Color	Function
Gray	Connects to outer electrode
Clear	Coaxial shield for gray wire
Orange	Connects to inner electrode
Clear	Coaxial shield for orange wire
Red	
White with red stripe	
White	
Clear	Shield for all RTD lead wires

Wiring Diagrams

Figure 6. Wiring for Sensor-Mounted Junction Box

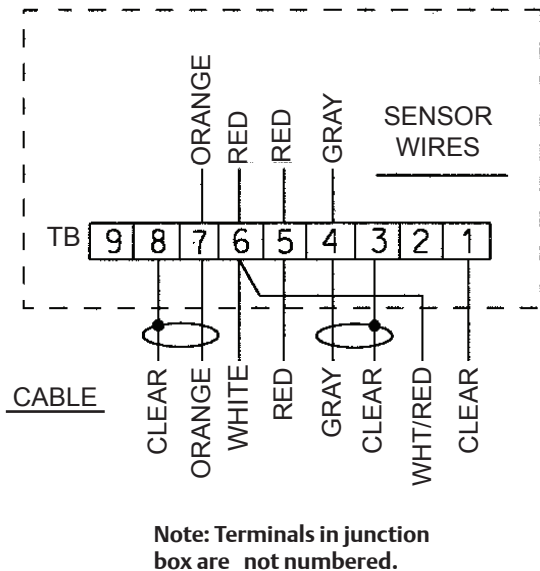


Figure 7. Wiring for 54eC and 54C

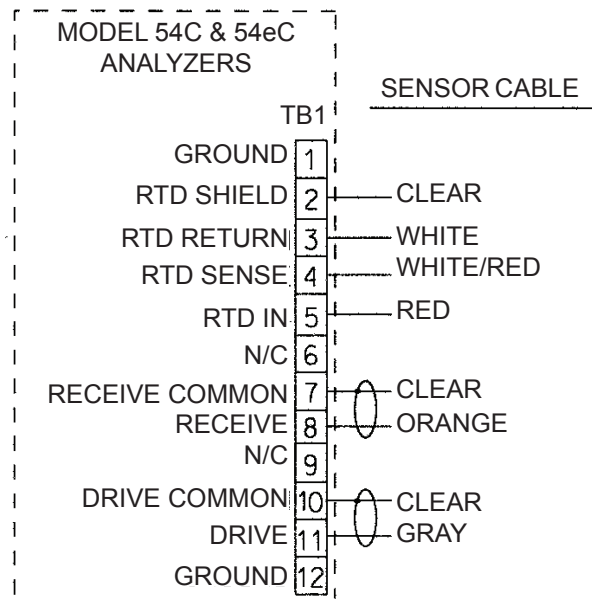


Figure 8. Wiring for 56 and 1056

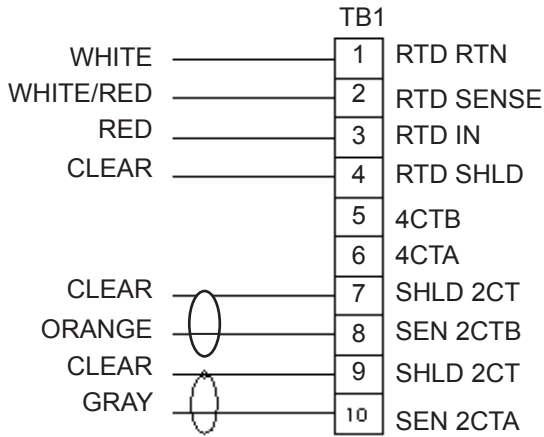


Figure 9. Wiring (Panel) for Xmt-C-10

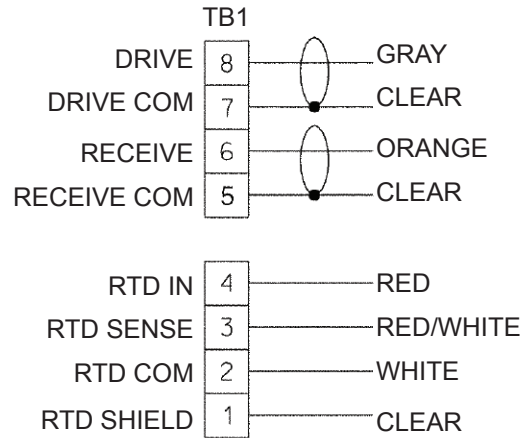


Figure 10. Wiring for Xmt-C-11 (Pipe or Wall)

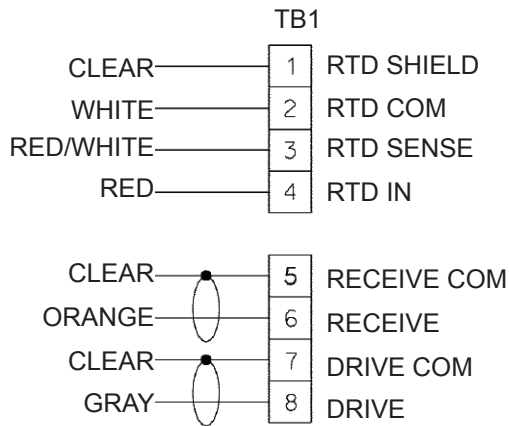


Figure 11. Wiring for 1066

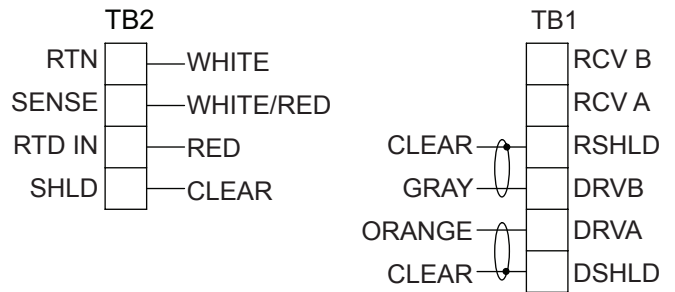


Figure 12. Wiring for 5081-C

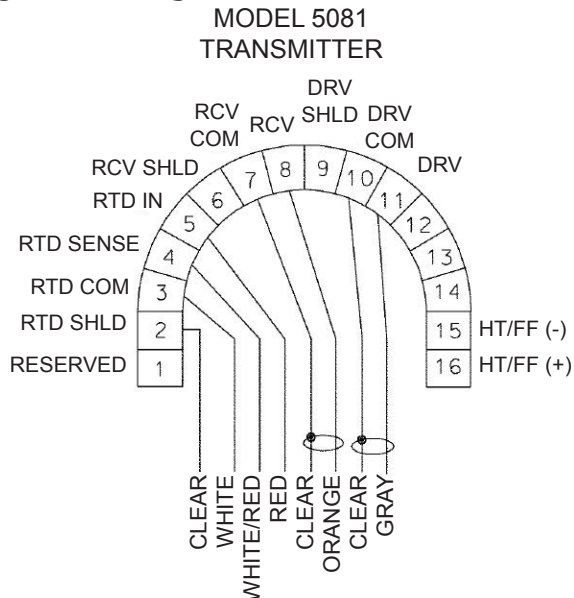
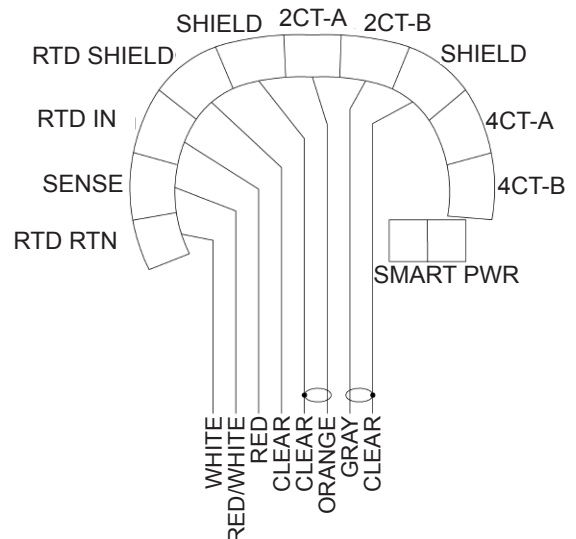


Figure 13. Wiring for 6081-C

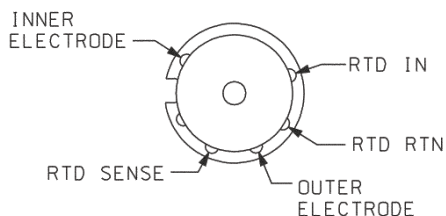


Wiring through a Junction Box

If wiring connections are made through a remote junction box (PN 23550-00), wire point-to-point. Use interconnecting cable 23747-00 (factory-terminated) or 9200275 (no terminations).

Pin Out Diagram for 402VP

Figure 14. VP pin-out



Cleaning the Sensor

Use a warm detergent solution and a soft brush or pipe cleaner to remove oil and scale. Isopropyl alcohol (rubbing alcohol) can also be used to remove oily films. Avoid using strong mineral acids to clean conductivity sensors.

Calibration

ENDURANCE conductivity sensors are calibrated at the factory and do not need calibration when first placed in service. Simply enter the cell constant printed on the label into the analyzer.

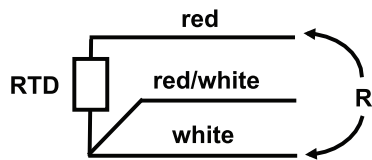
After a period of service, the sensor may require calibration. The sensor can be calibrated against a solution having known conductivity or against a referee meter and sensor. If using a standard solution, choose one having conductivity in the recommended operating for the sensor cell constant. Refer to the analyzer manual or product data sheet for recommended ranges. Do not use standard solutions having conductivity less than about 100 uS/cm. They are susceptible to contamination by atmospheric carbon dioxide, which can alter the conductivity by a variable amount as great as 1.2 uS/cm (at 25 °C). Because 0.01/cm sensors must be calibrated in low conductivity solutions, they are best calibrated against a referee meter and sensor in a closed system.

For more information about calibrating contacting conductivity sensors, refer to application sheet ADS 43-024, available on the Rosemount Analytical website.

Troubleshooting

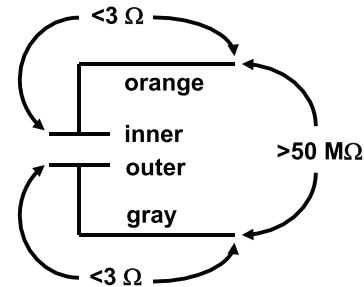
Problem	Probable Cause	Solution
Off-scale reading	Wiring is wrong.	Verify wiring.
	Temperature element is open or shorted.	Check temperature element for open or short circuits. See Figure 15 (next page).
	Sensor is not in process stream.	Be sure sensor is completely submerged in process stream.
	Variopool cable is not properly seated.	Loosen connector and reseal.
	Sensor has failed.	Perform isolation checks. See Figure 16 (next page).
Noisy reading	Sensor is improperly installed in process stream.	Be sure sensor is completely submerged in process stream.
	Variopool cable is not properly seated.	Loosen connector and reseal.
Reading seems wrong (lower or higher than expected)	Bubbles trapped in sensor.	Be sure sensor is properly oriented in pipe or flow cell. See Figure 1. Apply back pressure to flow cell.
	Wrong temperature correction algorithm.	Check that temperature correction is appropriate for the sample. See analyzer manual for more information.
	Wrong cell constant.	Verify that the correct cell constant has been entered in the analyzer and that the cell constant is appropriate for the conductivity of the sample. See analyzer manual.
Sluggish response	Electrodes are fouled.	Clean electrodes.
	Sensor is installed in dead area in piping.	Move sensor to a location more representative of the process liquid.





Figure 15. Checking Temperature Element
Disconnect leads and measure resistances shown. The measured resistance should be close to the value in the table.



temperature °C	resistance in Ω	
	Pt 100	Pt 1000
0	100.0	1000
10	103.9	1039
20	107.8	1078
30	111.7	1117
40	115.5	1155
50	119.4	1194

Figure 16. Checking Continuity and Leakage
Disconnect electrode leads and measure resistance and continuity as shown. Sensor must be dry when checking resistance between electrode leads.



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